WHAT IS CLAIMED IS:

1. A wrench comprising a head suitable for co-operating with a screw fastener, means for measuring the instantaneous applied torque, a head suitable for co-operating with a screw fastener, said head being fitted with means for measuring the instantaneous angle of rotation, input means for recording characteristics of the screw fastener and a setpoint value for tightening thereof, and processor means for calculating the instantaneous traction force on the screw fastener as a function of the measured instantaneous values of torque and angle and as a function of the stored characteristics of the screw fastener,

wherein the processor means further comprise software means for acting during the tightening operation to detect automatically the transition from the elastic deformation range to the plastic deformation range and to calculate the instantaneous traction force on the screw fastener as a function of the result of detecting the plastic deformation range.

2. A wrench according to claim 1, wherein the processor means calculate the instantaneous force in real time so as to enable the screw fastener to be tightened in a single stage.

3. A wrench according to claim 1, wherein the processor means further include software means for calculating the instantaneous coefficient of friction of the screw fastener being tightened, the instantaneous coefficient of friction C(t) being calculated by solving the following integral:

$$(2)\quad C(t) = \int_{t'=0}^{t'=t} \left[f(t').\frac{D_t}{2} + \frac{d_2}{2}.\frac{K'\tan\alpha + f(t').\cos(\alpha)}{K' - f(t').\sin\alpha} \right] dF(t')$$

where:

$$\begin{cases} d_2 = d\ \frac{3}{8}.\sqrt{3.p} \\ \tan\alpha = \frac{p}{\pi.d_2} \\ K' = \frac{1}{\sqrt{1 + \tan^2\alpha + \tan^2\beta}} \end{cases}$$

and:

D_t: equivalent diameter of contact between the washer and the head of the bolt;

d: thread diameter;

α: helix angle of the fastener thread;

d_2: theoretical diameter of contact between threads (on the flanks of the thread);

β: half-angle of the thread of the fastener (30° for ISO M thread).

4. A wrench according to claim 3, including means for detecting anomalies such as the connection binding as a function of the measured value for the coefficient of friction.

5. A wrench according to claim 1, wherein the means for measuring the instantaneous angle of rotation comprise a socket suitable for co-operating with the screw fastener, a bearing element made of a material having a low coefficient of friction, and a spring interposed between the socket and the bearing element, the end of the bearing element for coming into contact with the screw fastener being provided with an element having a high coefficient of friction.

6. A wrench according to claim 1, wherein the processor means include software means for restarting tightening that has been interrupted prior to reaching the setpoint value.

7. A wrench according to claim 1, further including storage means and a display device for storing and displaying information relating to tightening and available at the end of the tightening operation.

8. A wrench according to claim 7, wherein the information relating to tightening comprises in particular the torque C(t) and angle of rotation $\theta(t)$ values measured during tightening, the traction force F(t) calculated during tightening, the static and dynamic coefficients of friction (f_{static}, $f_{dynamic}$) calculated during tightening, and also the deformation range, with the corresponding plastic deformation information (C, θ, $F)_{plastic}$ in the event of the screw fastener being subjected to plastic deformation.

9. A wrench according to claim 7, wherein the information relating to tightening includes how the calculated coefficient of friction varied as a function of speed and of time.

10. A wrench according to claim 7, wherein the information relating to tightening includes the calculated difference between the static and dynamic coefficients of friction.

11. A wrench according to claim 1, wherein the setpoint value corresponds to a predetermined traction force, and wherein the wrench includes warning means operated by the processor means once the calculated force reaches the setpoint value.

12. A wrench according to claim 1, wherein the setpoint value corresponds to a predetermined tightening torque, and wherein the wrench includes warning means operated by the processor means when the measured torque value reaches the setpoint value.

13. A wrench according to claim 1, wherein the setpoint value corresponds to a predetermined tightening angle, and wherein the wrench includes warning means operated by the processor means when the measured value for the angle of rotation reaches the setpoint value.

14. A wrench according to claim 1, wherein said wrench is a manual wrench, the means for measuring instantaneous applied

torque, the input means, and the processor means being included in a handle to enable an operator to perform tightening manually.